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PATENT APPLN. NO. 10/519,073
RESPONSE UNDER 37 C.F.R. §1.111

MAR 29 2007

PATENT
NON-FINAL

REMARKS

For convenience in discussing applicants' response to the Action, the headings used in the Action are used below.

Specification

The disclosure is objected to because of alleged informalities. The Office's position is that it is unclear how the binder $\alpha 1$ differs from binder $\beta 1$ since both binders are produced by the same procedure of Experiment 1 and both binders use polyamic acid which is heat treated to produce polyimide from the polyamic acid and the polyamide [sic, polyimide] content, by weight, in the active material layer is 18.2%. The Office also states that it is unclear how binder $\alpha 2$ differs from binder $\alpha 3$.

Applicants submit that the differences among the binders ($\alpha 1$, $\beta 1$, $\alpha 2$ and $\alpha 3$) produced as described in the examples are clearly identified in Tables 2 and 6. Tables 2 and 6 identify the different physical properties of the binders. Nothing further is required.

Double Patenting

The Office has maintained the provisional double patenting rejections of claims 2-8, 11, 13-15, 17, 20-22 over claims of copending Application Nos. 10/363,039; 10/673,348 and 11/001,192. Applicants again request that these rejections be held in abeyance

pending the determination of allowable subject matter in the present application or one of the related applications.

Claim Rejections - 35 USC § 112

Claims 2-8, 11-13, 17, 20-22 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement.

This rejection is related to the objection to the specification. The Office's position is that undue experimentation would be required to determine the polyamic acids and thermoplastic polyimides used to make the invention as claimed.

Applicants submit that the reasons given by the Office for this rejection are not proper. The issue raised by a rejection for lack of enablement under the first paragraph of 35 U.S.C. § 112 is whether a person of ordinary skill in the art relating to the present invention, based on the description in the specification disclosure of the present application and the knowledge in the art, could practice the present invention (i.e., make and use the negative electrode recited in the claims of the application) without excessive (undue) experimentation. It is irrelevant whether or not the specifics of the polyamic acids and polyimides used in the experiments in the present application are described,

if the person of ordinary skill in the art could otherwise practice the invention.

Polyimides, their preparation and their properties are well-known in the prior art. The Office has not provided any evidence that the preparation of polyimides having properties as recited in the claims is unpredictable. The fact that different physical properties are obtained using different forms of polyamic acids (as noted in the Action on page 8, lines 1-2 under the heading "Factor (D) The level of predictability in the art"), is evidence of predictability - not unpredictability. Unpredictability would exist if different physical properties are obtained using the same or similar polyamic acids.

To properly support the rejection, the Office must provide proper evidence or reasoning supporting its position that a person of ordinary skill in the art could not, based on the knowledge in the art, generally, obtain polyimides or other binders having the properties recited in claim 2 without excessive experimentation. The fact that the present specification does not describe the polyamic acids and the polyimides subjected to heat treatment at 400°C for 30 hours to obtain binders $\alpha 1$, $\beta 1$, $\alpha 2$ and $\alpha 3$ is not. without evidence of known unpredictability or lack of knowledge concerning the preparation of polyimides, sufficient to show that

undue experimentation is required to practice the present invention.

Claim Rejections - 35 USC § 103

Claims 2-8, 11, 13-15, 20-22 are rejected under 35 U.S.C. 103(a) as obvious over Nobufumi (JP 20000-012088) (hereinafter: "Nobufumi") in view of Tsuji (U.S. Patent No. 6,432,579) (hereinafter: "Tsuji") and Solomon (U.S. Patent No. 4,927,514) (hereinafter: "Solomon"). Claim 17 is rejected under 35 U.S.C. 103(a) as obvious over Nobufumi in view of Tsuji and Solomon as applied to claim 2, and further in view of Gan (US 2002/0094480) (hereinafter: "Gan").

The position of the Office in these rejections is unclear because Nobufumi does not disclose a current collector or a binder having the properties recited in the claims of the present application and, as noted in the Action, does not disclose sintering at a temperature higher than the glass transition temperature of the binder and lower than the decomposition temperature of the binder. Notwithstanding these deficiencies, the Office on page 12, lines 7-11, states that the "properties recited in claim 2 are deemed to have been met by a process in which a surface roughened copper foil current collector and the binder are

sintered below the decomposition temperature and above the melting temperature of the binder."

It appears that the Office is taking the position that it would be obvious from Tsuji and Solomon to sinter the negative electrode of Nobufumi under conditions that would inherently result in the mechanical properties recited in claim 2. The Office states that Tsuji supports the obviousness of sintering the negative electrode of Nobufumi and that Solomon supports the obviousness of sintering the electrode at a temperature below the decomposition temperature and above the melting temperature of the binder. Gan is cited only as teaching the obviousness of using a polyimide as the binder in Nobufumi.

The rejections are not proper. Where claimed subject matter has been rejected as obvious in view of a combination of prior art references, a proper analysis under § 103 requires, inter alia, consideration of two factors: (1) whether the prior art would have suggested to those of ordinary skill in the art that they should make the claimed composition or device, or carry out the claimed process; and (2) whether the prior art would also have revealed that in so making or carrying out, those of ordinary skill would have a reasonable expectation of success. See *In re Dow Chemical Co.*, 837 F.2d 469, 473, 5 USPQ2d 1529, 1531 (Fed. Cir.

1988). Both the suggestion and the reasonable expectation of success must be founded in the prior art, not in the applicant's disclosure. *Id.* (Emphasis added).

The first factor has been interpreted as a requirement for a suggestion, teaching, or motivation to combine the prior art references. See *C.R. Bard, Inc. v. M3 Sys. Inc.*, 157 F.3d 1340, 1352, 48 USPQ2d 1225, 1232 (Fed. Cir. 1998). Evidence relevant to the finding of whether there is a teaching, motivation, or suggestion to select and combine the references relied on as evidence of obviousness is required. See, e.g., *McGinley v. Franklin Sports, Inc.*, 262 F.3d 1339, 1351-52, 60 USPQ2d 1001, 1008 (Fed. Cir. 2001). The showing of the requisite suggestion or motivation must be specific. See, e.g., *In re Kotzab*, 217 F.3d 1365, 1371, 55 USPQ2d 1313, 1317 (Fed. Cir. 2000) ("particular findings must be made as to the reason the skilled artisan, with no knowledge of the claimed invention, would have selected these components for combination in the manner claimed"). (Emphasis added).

In the present case, the Office has not provided any particular findings as to the reason the skilled artisan, without knowledge of the present application, would have combined the teachings of Nobufumi, Tsuji and Solomon.

Without a proper showing of the requisite teaching, motivation, or suggestion to select and combine the references relied on by the Office, the 35 U.S.C. § 103(a) rejections are improper and should be removed.

Notwithstanding the impropriety of the rejections, claim 2 has been amended to include the limitation of claim 11 and claim 11 has been canceled. According to claim 2 as amended sintering does not result in decomposition of the binder.

As noted by the Office, Nobufumi as modified by Tsuji does not teach sintering below the decomposition temperature of a binder¹. Tsuji teaches a sintering temperature of 500°C to 900°C. The Office has cited Solomon as teaching sintering an electrode at a temperature within a range of 280°C to 350°C to prevent deleterious polymer decomposition and is taking the position that a person of ordinary skill in the art would have modified Nobufumi, as modified by Tsuji, to use such sintering temperatures.

¹The Office further states that this "leads to a final product that does not cause full decomposition of a binder" (page 13, lines 5 to 6 of the Action). This statement does not appear to be correct. If Tsuji does not teach sintering below the decomposition temperature of a binder, then sintering may be carried out at a temperature above the decomposition temperature of the binder, in which case the binder may not be present in the final product.

Applicants respectfully submit that the proposed combination of Nobufumi, Tsuji and Solomon is improper and not supported by the teachings of the references.

Tsuji discloses, in the background of its invention, that in electrodes used in square-shaped batteries, where the electrode is composed of about 40% by volume of an active material, 20 to 30% by volume of a binder, a conductive material and a metal foil, and 30 to 40% by volume of pores, there is a problem that the binder, conductive material and metal foil do not contribute intrinsically to the capacity of the battery and limit the battery capacity per volume. (Col. 1, lines 32-38). Tsuji further discloses various means disclosed in the art for increasing the capacity per unit volume including forming the electrode of a sintered material and describes that an advantage of forming an electrode of a sintered material, is that it is "possible to eliminate the binder" (Col. 1, lines 46-47) and thereby increase the filling density of the active material.

Tsuji, in light of the background relating to the elimination of a binder by sintering, discloses as its invention, a process for obtaining a high capacity by sintering a silicon-containing coated film and a base material made of a foil or mesh of conductive material in a non-oxidizing atmosphere. (Col. 2, lines 34-44). A

person of ordinary skill in the art, therefore, would have expected that Tsuji does not intend for a binder to remain in the sintered electrode. This expectation is supported by the examples in Tsuji.

In Example 1 of Tsuji, the resulting coated film was sintered at 900°C (col. 6, lines 18 to 21). In Example 2, the resulting coated film was sintered at 750°C (col. 6, line 50). In Example 3, the resulting coated film was sintered at 900°C, in the same manner as in Example 1 (col. 7, lines 8 to 9). In Example 4, the resulting coated film was sintered at 800°C (col. 7, lines 23 to 24). Accordingly, the coated films of Examples 1 to 4 (and other examples using the same conditions as in these examples) of Tsuji were sintered at 750°C or higher.

Polyvinylidene fluoride (PVdF), used as a binder in Examples 1 to 4 of Tsuji, would have been decomposed by sintering at 750°C or higher used in the examples. Therefore, the binder does not remain in the sintered material disclosed in Tsuji and would not have been expected to remain in an electrode of Nobufumi, if prepared according to the teachings of Tsuji.

Moreover, since the intent of the invention of Tsuji is a process for producing an anode to obtain a high capacity, a person of ordinary skill in the art would not have been motivated to modify the combination of Nobufumi and Tsuji as proposed in the

action to prevent decomposition of the binder, i.e., to use the sintering temperature of Solomon which is "sufficiently low to not cause any deleterious polymer [binder] decomposition" (Col. 5, lines 13-14), because, as noted above, Tsuji discloses that materials such as a binder are a problem in that they do not contribute intrinsically to the capacity of a battery and, thus, limit the battery capacity per volume.

Stated differently, the proposed modification of the electrode obtained according to a combination of Nobufumi and Tsuji to use the sintering conditions of Solomon for the purpose of maintaining the binder in the electrode is inconsistent with the teachings of Tsuji which provide that a binder limits battery capacity and that sintering should result in the decomposition of the binder. Therefore, the proposed combination is improper.

Solomon cannot be relied on as proposed in the Action because the proposed modification of Tsuji runs counter to the disclosure of the invention of Tsuji and would destroy the invention on which Tsuji is based.

For the above-explained reasons, the Office has not supported a case of *prima facie* obviousness of the negative electrode of the present invention, the method for making the negative electrode of the present invention and the rechargeable lithium battery

containing the negative electrode of the present invention. Removal of the 35 U.S.C. 103(a) rejection of the claims is in order and is respectfully requested.

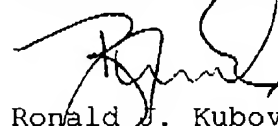
Moreover, it is respectfully submitted that the comparative data in the application rebut any *prima facie* obviousness alleged by the Office to be supported by the proposed combination of Nobufumi, Tsuji and Solomon. The Office has failed to address the comparative data in the application.

The foregoing is believed to be a complete and proper response to the Office Action dated November 29, 2006.

In the event that any fees are required in connection with this response, please charge Deposit Account No. 111833.

Respectfully submitted,

KUBOVCIK & KUBOVCIK



Ronald J. Kubovcik
Reg. No. 25,401

Atty. Case No. MAM-056
The Farragut Building
Suite 710
900 17th Street, N.W.
Washington, D.C. 20006
Tel: (202) 887-9023
Fax: (202) 887-9093
RJK/jbf